MASTER OF EDUCATION (ONE YEAR) IN STEAM EDUCATION

CURRICULUM

MASTER OF EDUCATION (ONE YEAR)

SPECIALISATION: STEAM EDUCATION

KATHMANDU UNIVERSITY

SCHOOL OF EDUCATION

(KUSOED)

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Kathmandu University School of Education (KUSOED) offers high-quality teacher education programs with a holistic approach for developing competent teachers, teacher educators, and educational leaders who can contribute towards meaningful and life-affirming pedagogical processes. The shift in the educational processes is needed for developing skilled and visionary educational professionals. The objectives of KUSOED are:

- to offer practical educational programs that provide knowledge and skills to address the current educational problems of Nepal;
- to develop trainers and teachers equipped with a variety of instructional skills, strategies, and methodologies required for creating effective teaching and learning environments; to produce and disseminate high-quality teaching and learning materials;
- and to develop school managers and educational leaders with competent, effective management skills related to school programs.

In the given organisational context, the proposal discusses the need for the program of M Ed (One Year) in STEAM Education, eligibility for the prospective students, program structure, course descriptions and student assessment modalities.

Rationale

***Pedagogical approach*:** The emerging need for pedagogical innovation has indicated trans, multi and interdisciplinary approaches to holistic and sustainable learning via combinations of science and arts-based approaches. STEAM as a pedagogical approach is considered helpful for learners to develop both analytic and creative faculties by using project-based, inquiry-based and problem-based learning in an integrated learning environment. Different disciplines in STEAM Education are regarded as references of skills and knowledge systems for learners to solve real-world problems, to develop transversal competences, to design innovative STEAM products, and to experience a productive culture of learning.

***Design principle of educational programs*:** In the context of Nepal, there is a need for a radical change in designing educational programs that offer a synergistic platform via combinations of otherwise incompatible disciplines for creating a generation of

problem solvers and innovators in this rapidly changing world. STEAM Education as a design principle, therefore, emphasizes rebuilding educational programs by integrating knowledge ecologies generated through different disciplinary frameworks because programs based on a single disciplinary framework are considered less likely to address the problems (of climate change, pandemic, terrorism, exclusion and hate-crimes) faced by the planet and its habitants.

***An approach to educational transformation*:** The transformation of educational process from the disciplinary egocentrism to humility-based trans, multi and interdisciplinary enterprise is sought because the day-to-day problems do not seem to be solved by limited knowledge and skills-sets offered by a narrowly conceived educational process as disciplinary knowledge transmission. For this, transformative learning (that promotes critical, reflective and imaginative modes of thinking and being) should be integrated in restructuring the school and higher education to produce graduates capable of addressing real-world challenges. STEAM as an approach to teaching and learning enables teachers to be critical and creative by developing skills, knowledge and values, thereby strengthening their abilities to critically reflect on their practices of teaching and learning within the existing system of education. More so, STEAM Education enhances teachers' professional qualities in designing tasks for learning in an integrated context by combining cognitive, affective, psychomotor, and spiritual dimensions of educational processes. Thus, STEAM Education has this potential to transform the educational practices from a disciplinary egocentrism to innovative and imaginative openness.

***Bridge between the world of work and academia*:** This STEAM Education program aims at making the shift from the traditional classrooms to makerspaces in which students have a plethora of opportunities to involve in hands-on activities of making and executing plans, discussing collaboratively and making rational decisions, and developing imagination and creativity as they are exposed to various possibilities. More so, both students and teachers explore opportunities in their real-world contexts through experiential learning approaches in which students critically and creatively think and work for solving work-based problems. Likewise, STEAM Education offers

frameworks for students to develop transversal competences that are useful to connect the world of work and educational processes.

With these perspectives, KUSOED has developed a Master of Education (One-Year) program in STEAM Education. The MEd program is specially designed for in-service teachers, teacher educators, school leaders, and recent graduates who are interested in developing expertise in STEAM Education through this innovative educational program.

Program Objectives

The Master of Education (One Year) program intends to promote innovative pedagogical approaches by combining global and local perspectives of education and primarily aimed to produce education professionals (e.g., teacher trainers, curriculum developers, material developers, program coordinators, and headteachers) dedicated to basic education. Additionally, it addresses the demands of integrating elements of cognitive and affective domains of learning in order to develop competent education professionals at any level. This M Ed program aims at showcasing teacher education programs as an enterprise of lifelong learning that is grounded in holistic, context-based and multi-methods approach to educational practice and research.

After the completion of the course, the students will be enabled to:

- Design trans, multi and interdisciplinary curricula through STEAM Education perspectives;
- Develop a sound understanding of STEAM Education and practitioners research in the field of STEAM Education;
- Design professional development programs for prospective and in-service teachers;
- Develop competences in using ICT tools in pedagogical contexts for meaningful and engaged learning;
- Adapt innovative pedagogical approaches (such as design thinking) to enable learners as innovative problem solvers;
- Make use of the field of STEAM Education with adequate theoretical and practical knowledge in planning, teaching, adapting, institutionalizing and evaluating educational experiences;

- Facilitate the process of developing human and other resources in the field of STEAM Education;
- Contribute to the process of the transformation of educational practices with an emphasis on skills development in the context of contemporary instructional strategies;
- Embrace innovation and creativity in their roles as instructional leaders in the field of STEAM education; and
- Prepare teaching and learning resources for instructional practices based on STEAM perspectives.

Duration of the program

The program is structured as a one-year (two semesters) program for regular students. In the case of part-time students, they are required to complete the program in two years.

Eligibility Requirements

The candidates having a Master's degree in any discipline from a university or an institution recognized by Kathmandu University are eligible to apply in the M Ed (One Year) Program in STEAM Education.

Structure of the program

The program is for two semesters. There are nine courses for 27 credits comprising two Core Courses (6 credits), five Professional Courses (15 credits) and two Practical Courses (6 Credits). Apart from these courses, non-credit workshops shall be offered. The weightage of such workshop shall be 30 hours per semester.

Total Courses (27 Cr. Hrs.)	
Core Courses (6 Cr. Hrs.)	EDUC 508: Theory and Practice in Education (3)
	EDUC 509: Research Methodology (3)
Professional Courses (15 Cr. Hrs)	
Specialization courses (9 Cr. Hrs)	STEAM Ed 501: Information Communication Technologies (ICTs) in STEAM Education (3)
	STEAM Ed 511: Innovative Pedagogies (3)
	STEAM Ed 521: Curriculum Leadership (3)
Elective Courses (Any two) (6 Cr. Hrs)	STEAM ED 520 Resource Material Development in STEAM Education (3)
	STEAM Ed 525 Education for Sustainable Development (3)
	STEAM Ed 530 Action Research (3)
	STEAM Ed 535: Perspectives in STEAM Education (3)
	STEAM Ed 540 STEAM Pedagogy for Mathematics Education (3)
	STEAM Ed 545 STEAM Pedagogy for Science Education (3)
	STEAM Ed 550 STEAM Pedagogy for Language Arts Education (3)
	STEAM Ed 555 Creative Arts in STEAM Education (3)
	STEAM Ed 560 Gender and Indigenous Knowledge (IK) in STEAM Education (3)
	STEAM Ed 570: Advanced Topics in STEAM Education (3)
Practical Courses (6 Cr. Hrs)	STEAM Ed 541 STEAM Educational Research Project (3)
	STEAM Ed 544 Practicum (3)
Non-Credit Workshops (30+30 hours)	Non-credit workshops (30 hours per semester) shall be offered in areas that are foundational and essential for enhancing basic skills in areas of fine arts, technology and design etc.

COURSE DESCRIPTIONS

Core Courses (6 Credit hours)

The core courses are common to all Master programs. There are two core courses prescribed for Master students.

EDUC 508 Theory and Practice in Education (3)

This course is about linking educational theories into practices. Educational theories are used to know, understand, prescribe and apply into educational practices. This course includes many areas such as, ethics of belief, politics, social values, pedagogy, andragogy, curriculum, learning, teaching, policy, plan, leadership, culture, etc. linked with different educational turns. The course orients students to acquire transversal skills and use them in the classroom. The course also discusses some selected theories of education to capture the different turns of education. The main aim of the course is to widen the horizon of the knowledge and practices of students so that they would be able to identify day-to-day educational problems and issues associated with educational turns and implement the best educational practices. The course enables students to examine educational practices through the different turns of education and has been organised under the following modules:

EDUC 509 Research Methodology (3)

This course aims to be an introduction to provide key concepts related to research methodologies. More specifically, the course incorporates different research designs including case study, comparative and experimental research designs; ethnography, , narrative research, action research and critical research. The course aims at developing competence among the students to plan and conduct research utilizing quantitative and qualitative research approaches in schools and other community sites that impact education. Students will also participate in field activities by critically considering a range of practitioner research as a part of this course. Students demonstrate skills of developing a research report based on the field work in a natural setting.

Professional Courses (15 Credit hours)

The professional courses are considered to be the signature courses of a specialization. As far as the program is concerned five courses – three courses as specializations and two courses as elective courses-- are prescribed as professional courses.

Specialisation courses (9 Credit Hours)

STEAM Ed 521 Curriculum Leadership (3)

This course aims at developing curriculum leadership in sorting out and prioritizing the tasks associated with the curriculum development process, such as ensuring curriculum

quality and applicability, integrating and aligning the curriculum, implementing the curriculum efficiently and effectively, and regularly evaluating, enriching and updating the curriculum from the local as well as global perspectives. Moreover, a curriculum leader should be well aware of how curriculum informs instructional design and provides a list of functions of curriculum leadership to be carried out at school and classroom levels. At school level, the function of curriculum leaders is in developing the school's vision of quality curriculum to meet the national and/or local education goals by developing the school's program of studies such as teaching and learning schedule, and integrating, aligning, monitoring and assisting in the curriculum. At classroom level, the curriculum leaders develop yearly academic planning calendars for operationalizing the curriculum, and develop units of study enriching and evaluating the curriculum to remediate learning. In this scenario, this course helps students learn the conceptual understanding of curriculum and develops the leadership skills of implementing the curriculum at school and classroom levels from the STEAM education perspective.

STEAM Ed 501: Information Communication Technologies (ICTs) in STEAM Education (3)

Due to the revolution in ICTs, the world is being transformed into a global village signaling the arrival of 4.0 industrial revolution. Thus, ICT tools and techniques have become an inseparable part of our profession. Technology is all about using tools, techniques, and science to create more effective ways of doing things, such as visualizing experiments and concepts, assisting students to research on the topic, reporting and records-sharing and designing lessons with better assessment methods. ICT has become a part of the curriculum for years. In STEAM Education, technology plays an important role in developing multiliteracies, such as information literacy, media literacy, and communication technology literacy. In addition to this, technology supports learning and instruction with STEAM disciplines by creating representations of knowledge, thereby supporting efficient decision-making and enabled personalized learning. In this context of educating STEAM professionals, this course enables learners to utilize educational technologies as enablers of pedagogical ideas by connecting ICT with science, engineering, arts, mathematics, and other disciplines. A number of activities include designing and implementing technology-enhanced educational materials and/or tools that serve meaningful and life-affirming learning. Thus, the course is apt to develop potential ICT knowledge, skills and competencies in relation to STEAM education.

STEAM Ed 511: Innovative Pedagogies (3)

In this constantly changing landscape, there is a widespread consensus that the educational system should empower learners with knowledge, skills, and competencies. The context is about integrating the transversal skills (21st-century skills or soft skills). For this, the educational system should be restructured progressively to include the innovative pedagogical approaches to teach different subjects in an integrated way. In this phenomenon, this course has been made to provide students the theoretical

orientation of innovative pedagogies such as problem-solving, inquiry-based, project-based, story-based, etc. which are powerful methods to address the holistic development of the learners. Similarly, this course aims at providing practical knowledge and skills to implement these pedagogical practices in the context of teaching and learning. Learners get equipped with the knowledge and skills of these pedagogies that lead the innovation in teaching and learning of STEAM-related subjects. In addition to this, the course welcomes the practical knowledge and skills to integrate several disciplines with the help of innovative pedagogies.

Elective Courses (Any two) (6 Credit hours)

STEAM ED 520 Resource Material Development in STEAM Education

The widespread consensus is that hands-on materials are immensely imperative to develop conceptual knowledge. The concrete materials are helpful for both toddlers and young children to construct knowledge practically because these help in using all the human senses to perceive the meaning. In this context, this course aims at providing educators both theoretical and practical knowledge of designing and developing materials to teach STEAM-related contents. Learners will be enhanced and empowered with the practical knowledge about integrating the arts to develop materials that are powerful to address not only the cognitive but also affective and psychomotor domain of students. In this course, students develop various resources materials and share.

STEAM Ed 525 Education for Sustainable Development (3)

This course aims at integrating sustainable development concepts set by UNESCO into STEAM education in the most effective ways for increasing the effectiveness of Education for Sustainable Development (ESD). Moreover, according to UNESCO (2014), ESD allows every human being to acquire the knowledge, skills, attitudes and values necessary to shape a sustainable future. ESD means including key sustainable development issues into participatory teaching and learning methods that motivate and empower learners to change their behaviour and take actions for sustainable development. Education for Sustainable Development consequently promotes competencies like critical thinking, imagining future scenarios and making decisions in a collaborative way. Therefore, this course helps students develop their theoretical knowledge about sustainable development goals (SDG) based on 17 SDG goals set by UNESCO and learn the skills of integrating them into curriculum and teaching and learning practices of STEAM education.

STEAM Ed 530 Action Research (3)

Action research is personal and professional learning that provides an opportunity for career development, as it is conducted in a real-world setting to improve or refine one's performance or action. In this course, the students involve in developing hands-on activity (actions) based on the real-life problem seeking out potential solutions that can

be implemented in the classroom. In the process of refining the action or performance, the students (educators) find their experience empowering. The learners develop an action plan trying new tools and strategies incorporating technology and arts to meet the diverse needs of today's students and apply in their classroom. This course helps educators to be more effective as this is a disciplined inquiry approach. Thus, the course aims at providing practical knowledge to the educators so that they can perform action research in the real-world setting. Thus, the four major strengths of this class are performing informed action, reflecting on the action, enhancing their performance, and empowering oneself.

STEAM Ed 535: Perspectives in STEAM Education

In this rapidly changing world, the inclusion of ongoing debate, thoughts, philosophies, human psychologies, and theories in the education system is a must. One of the goals of education is to make people capable of understanding the present situations and changes. In this context, this course aims at incorporating the contemporary local and global perspectives on STEAM education. Therefore, the learners will be equipped with philosophical and practical knowledge about various perspectives associated with STEAM education. This course also helps learners explore the gap between the contemporary thoughts around STEAM Education vis-à-vis our education system.

STEAM Ed 540 STEAM Pedagogy for Mathematics Education (3)

Out of various dimensions of STEAM Education, STEAM pedagogy is one of the widely discussed approaches in school education in general and in mathematics education in particular. There are various pedagogical approaches in school mathematics. Since the last decade, STEAM as a pedagogical approach has been very much popular around the globe. In this context, this course aims to develop professional skills for mathematics teachers and educators who can develop STEAM- based lessons and projects. The interactive sessions help learners to identify the issues of teaching and learning mathematics, develop various ICT-integrated, Arts-based and Design-led activities and projects to create meaningful learning in mathematics. The major purpose is to make learners able to explore various dimensions of STEAM pedagogy and use them in mathematics teaching. While doing so, the facilitators create a rich learning environment where learners can develop and use hands-on materials and activities during the course.

STEAM Ed 545 STEAM Pedagogy for Science Education (3)

The real-world has complex problems. To solve the complex problems, one needs to look at the problem from multiple angles. The traditional instructional science teaching does not incorporate multi-facet perspectives to deal with the complex problems nor does it generate inquiry in the students to engage in active science learning. STEAM pedagogy can be an alternative to engage learners in exploring, discovering and finding solutions to the problems and be engaged in science learning. This course engage

learners in hands-on science activity incorporating technology and arts. The learners involve in developing science models using technology and arts connecting science with different subjects for better understanding. The learners engage in developing projects, problem-based science lessons to be used in actual classrooms using inquiry-based approach integrating technology and arts. It enhances students transvershal skills (21st century skills as a basis for harnessing creativity in solving real world problems and establishing connections across other disciplines.

STEAM Ed 550 STEAM Pedagogy for Language Arts Education (3)

Language arts education has been viewed as an important component in educational processes and programs in general and STEAM Education in particular for the reasons STEM professionals require well-developed language skills to share their research and practice among other professionals. Likewise, language is not limited to skills rather language is constitutive of our cognitive and affective repertoires. Given this context, the course aims at developing a host of STEAM pedagogies appropriate for language arts education, such as the use of digital media, content-based language learning, reading and writing, and language arts-driven projects. Of specific focus, the course covers areas, such as writing, speaking, visual representing, reading, listening, viewing and critical thinking.

STEAM Ed 555 Creative Arts in STEAM Education (3)

Fostering the creativity of the learner is at the centre of designing STEAM curricula. In this context, the creative arts act as tools and as inspiration to empower each learner to find their own way to engage in real world problem solving. We explore the how and why the "**A**rts" is included in STE**A**M Education and think about it in the specific context of Nepal's educational settings and policies. We identify the essence of the arts, its diverse forms, and the ways it allows for people with diverse learning styles to engage in transformative learning. In this way, the arts become essential critical thinking tools to find new ways to combine one's thoughts, research, analyze, communicate, produce, and assess one's learning. This course focuses on the pedagogic vocabulary made available through the creative arts in educational settings, provides concrete examples and explores systemic interventions that can enable project based learning through the arts.

STEAM Ed 560 Gender and Indigenous Knowledge (IK) in STEAM Education (3)

This course aims at exploring gender and indigenous knowledge and integrating them into STEAM education to promote holistic education through gender-responsive and indigenous-responsive pedagogies. On the one hand, observations of classroom practices show that teaching and learning is largely gender-biased as many teachers apply teaching methodologies that perpetuate gender stereotypes and hence do not give equal opportunities to all learners to participate in classroom activities. Therefore, there is an urgent need to introduce gender responsive pedagogy. On the other hand, the Western Modern Worldview has been hegemonizing the education systems across the world, thereby subordinating (or even neglecting) the ‘Knowledge of the Land’ that

arise from indigenous knowledge systems in which the people of that land have come to understand themselves in relationship to their natural environment and how they organize the folk knowledge of flora and fauna, cultural beliefs and history to enhance their lives. Therefore, this course helps students develop a sound understanding of gender equality and equity, and indigenous cosmology by integrating gender-responsive and indigenous-responsive pedagogies in STEAM Education.

STEAM Ed 570 Advanced Topics in STEAM Education

The course deals with recent developments in the field of STEAM Education. The main purpose of this course is to acquaint students with ongoing research and/or practice in the intersections of two or more of technology, science, mathematics, arts and engineering education.

Practical Courses (6)

The practical courses are designed to develop abilities among students to carry out a research project and gain experience as an intern (as a trainer, teacher or any other roles).

STEAM Ed 541 STEAM Educational Research Project (3)

Educational research projects are conducted to solve existing problems arising from professional contexts of practitioners. The purpose of such projects is not only to inform about an educational practice but also to envisage ways to address them. In this rapidly changing and complex world, educational research projects are required to work towards envisioning a sustainable future. In this vein, this course aims at providing both practical knowledge and skills of designing and carrying out interdisciplinary research studies. Learners will be equipped with knowledge about carrying out research projects in the STEAM landscape. The course helps learners explore the practical problems and issues in STEAM related areas, conduct a research study under specified area of interest, and come up with an accomplished research project at the end. These research projects contribute to address the knowledge and practice gap in domains of STEAM Education.

STEAM Ed 544 Practicum (3)

This course is designed to provide students with practical work experience in their field. Moreover, practicum refers to experiences that a trainee educator should have before the educator takes on the full range of responsibilities required for their professional development. A trainee educator should develop their skills of teaching based on theoretical knowledge that the educator has acquired before entering the classroom for teaching different subjects. Similarly, a trainee educator should also develop required skills before the educator takes on the full responsibilities of conducting training and/or workshops for pre-service and in-service teachers. Therefore, this course helps students develop their skills based on theoretical and practical knowledge which they have acquired from different courses of STEAM education. The students also develop a

practicum plan and implement in the field under the supervision of the course facilitators in the standard prescribed by the School.

Non-Credit Workshops
Non-credit workshops (30 hours per semester) shall be offered in areas that are foundational and essential for enhancing basic skills in areas of fine arts, technology and design, etc.

ASSESSMENT AND CERTIFICATION

KUSOED adopts semester-based assessment system that has been guided by the decisions of KU's Academic Council. It follows the letter grading system. A student gets a graduation award after meeting the following requirements:

- Satisfactory completion of all courses prescribed for this program
- At least C in each of the individual courses and a Cumulative Grade Point Average (CGPA) 3.0.