**University of Management and Technology**

**Course Outline**

Course code…… ED-768 Course title: **Perspectives of STEM Education**

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| --- | --- |
| Program | Ph.D. Education |
| Credit Hours | 3 |
| Duration | 16 Weeks |
| Prerequisites |  |
| Resource Person |  |
| Counseling Timing  (Room# ) |  |
| Contact |  |

**Chairman/Director signature………………………………….**

**Dean’s signature…………………………… Date………………………………………….**

**Learning Objectives**

After completion of the course the students will be able to:

* has an advanced overview of current and historical and philosophical perspectives in STEM
* is able to acknowledge the complexity and variation of scientific and technological knowledge and practices
* has insights into how technological knowledge can be conceptualized and the roles technology may play in science education
* has knowledge about sustainable development and the role of STEM education in contributing to sustainability
* identify the historical-philosophical roots of new trends in STEM education, and recognize and compare theoretical perspectives on learning in textbooks and academic discourse
* use perspectives from STEM education research in own research
* discuss the nature of professional scientific and technological practices and question how they appear in textbooks and other materials for science teaching
* frame research and education to contribute to sustainable development
* identify, convey and discuss perspectives on STEM teaching and learning, orally as well as in writing

**Learning Methodology:**

The course will be taught using a variety of techniques and modes including on-campus lectures, discussions, reading assignments, presentations, group work, and research projects.

**Grade Evaluation Criteria**

Following are the criteria for the distribution of marks to evaluate the final grade in a semester. This is a tentative distribution, which may vary as per directions from the competent authority of UMT.

**Marks Evaluation Marks Percentage**

Quizzes 10

Assignments 10

Mid Term/Project(s) 20

Presentation 15

Attendance 05

Class Activity 05

Viva Voce 05

Final Exam 30

**Recommended Text Books:**

Banks, F., & Barlex, D. (2020). *Teaching STEM in the secondary school: Helping teachers meet*

*the challenge*. Routledge.

Curry, M. J., & Hanauer, D. I. (Eds.). (2014). *Language, literacy, and learning in STEM*

*education: Research methods and perspectives from applied linguistics* (Vol. 1). John

Benjamins Publishing Company.

Langman, J., & Hansen-Thomas, H. Discourse Analytic Perspectives on STEM Education.

Felder, R. M., & Brent, R. (2016). *Teaching and learning STEM: A practical guide*. John

Wiley & Sons.

MacDonald, A., Danaia, L., & Murphy, S. (2020). *STEM Education Across the Learning*

*Continuum*. Springer.

**Reference Books:**

Honey, M., Pearson, G., & Schweingruber, H. (Eds.). (2014). *STEM integration in K-12*

*education: Status, prospects, and an agenda for research*. Washington, DC: National

Academies Press.

Information Resources Management Association (Ed.). (2014). *STEM Education: Concepts,*

*Methodologies, Tools, and Applications*. IGI Global.

Southwest Regional STEM Network. (2009). *Southwest Pennsylvania STEM network long*

*range plan (2009-2018): Plan summary*. Pittsburgh, PA

**Other References:**

Bryan, L., & Guzey, S. S. (2020). K-12 STEM Education: An overview of perspectives and

considerations. *Hellenic Journal of STEM Education*, *1*(1), 5-15.

Çevik, M., & Özgünay, E. (2018). STEM Education through the Perspectives of Secondary

Schools Teachers and School Administrators in Turkey. *Asian Journal of Education and Training*, *4*(2), 91-101.

English, L. D. (2016). STEM education K-12: Perspectives on integration. *International*

*Journal of STEM education*, *3*(1), 1-8.

Guan, N. H., Bunyamin, M. A. H., & Khamis, N. (2020). Perspectives of STEM education

from physics teachers' points of view: A quantitative study. *Universal Journal of Educational Research*, *8*(11).

Kaarst-Brown, M. L., & Guzman, I. R. (2010, May). A cultural perspective on individual choices of STEM education and subsequent occupations. In *Proceedings of the 2010 Special Interest Group on Management Information System's 48th annual conference on Computer personnel research on Computer personnel research* (pp. 55-65).

Lee, O. (2011, May). Effective STEM education strategies for diverse and underserved

learners. In *Workshop of the Committee on Highly Successful Schools or Programs for K-12 STEM Education, National Research Council, Washington, DC*.

Mohr-Schroeder, M. J., Cavalcanti, M., & Blyman, K. (2015). STEM education:

Understanding the changing landscape. In *A practice-based model of STEM teaching* (pp. 3-14). Brill.

Ortiz-Revilla, J., Adúriz-Bravo, A., & Greca, I. M. (2020). A framework for epistemological

discussion on integrated STEM education. *Science & Education*, *29*(4), 857-880.

Petrosino, A. J., Sherard, M. K., & Tharayil, S. A. (2020). The education philosophy,

theories and models that enable STEM policy integration. In *STEM in the Technopolis: The Power of STEM Education in Regional Technology Policy* (pp. 51-63). Springer, Cham.

Rifandi, R., & Rahmi, Y. L. (2019, October). STEM education to fulfil the 21st century

demand: a literature review. In *Journal of Physics: Conference Series* (Vol. 1317, No. 1, p. 012208). IOP Publishing.

Rosa, M., & Orey, D. C. (2021). An ethnomathematical perspective of STEM education in a

globalized world. *Bolema: Boletim de Educação Matemática*, *35*, 840-876.

Tunc, C., & Bagceci, B. (2021). Teachers' Views of the Implementation of STEM Approach

in Secondary Schools and the Effects on Students. *Pedagogical Research*, *6*(1).

Xie, Y., Fang, M., & Shauman, K. (2015). STEM education. *Annual review of sociology*, *41*,

331.

**Calendar of Course contents to be covered during the semester**

**Course Code****:** ED 768 **Course Title**: **Perspectives of STEM Education**

|  |  |  |
| --- | --- | --- |
| **Weeks** | **Course Contents** | **Reference** |
| 1 | Overview course outline  Analytic Perspectives:  Examining Learners’ Appropriation Through Discourse in Diverse Math and Science Classroom Settings | Langman, J., & Hansen-Thomas, H. Discourse Analytic Perspectives on STEM Education.  Tunc, C., & Bagceci, B. (2021). Teachers' Views of the Implementation of STEM Approach |
| 2 | Analytic Perspectives:  Expanding the Context: Considering Cultural Reproduction in the Math Classroom | Langman, J., & Hansen-Thomas, H. Discourse Analytic Perspectives on STEM Education |
| 3 | Analytic Perspectives :  Applying Discourse-Based Approaches to Teacher Preparation in Science | Langman, J., & Hansen-Thomas, H. Discourse Analytic Perspectives on STEM Education |
| 4 | Teaching perspective:  Teaching science in the light of STEM | Banks, F., & Barlex, D. (2020). *Teaching STEM*  Guan, N. H., Bunyamin, M. A. H., & Khamis, N. (2020). Perspectives of STEM education |
| 5 | Teaching perspective:  Teaching design & technology in the light of STEM | Banks, F., & Barlex, D. (2020). *Teaching STEM* |
| 6 | Teaching perspective:  Teaching mathematics in the light of STEM | Banks, F., & Barlex, D. (2020). *Teaching STEM* |
| 7 | Cultural Perspective: | Xie, Y., Fang, M., & Shauman, K. (2015).  Rosa, M., & Orey, D. C. (2021).  Lee, O. (2011, May). Effective STEM education  Kaarst-Brown, M. L., & Guzman, I. R. (2010, May). A cultural perspective |
| 8 | The role of STEM enhancement and enrichment activities | Banks, F., & Barlex, D. (2020). *Teaching STEM*  Çevik, M., & Özgünay, E. (2018). STEM Education |
| 9 | Historical view of STEM education | Bryan, L., & Guzey, S. S. (2020). An overview of perspectives and considerations  Rifandi, R., & Rahmi, Y. L. (2019, October)  Mohr-Schroeder, M. J., Cavalcanti, M., & Blyman, K. (2015) |
| 10 | Philosophical perspective in STEM Education | Ortiz-Revilla, J., Adúriz-Bravo, A., & Greca, I. M. (2020)  Couso, D., & Simarro, C. (2020)  Petrosino, A. J., Sherard, M. K., & Tharayil, S. A. (2020). |
|  | Research Perspective:  Research studies in science | Curry, M. J., & Hanauer, D. I. (Eds.). (2014). *Language, literacy, and learning in STEM education* |
| 11 | Research Perspective:  Research studies in mathematics | Curry, M. J., & Hanauer, D. I. (Eds.). (2014). *Language, literacy, and learning in STEM education* |
| 12 | Research Perspective:  Research studies in engineering | Curry, M. J., & Hanauer, D. I. (Eds.). (2014). *Language, literacy, and learning in STEM education* |
| 13 | Research Perspective:  Facilitating interdisciplinary collaboration | Curry, M. J., & Hanauer, D. I. (Eds.). (2014). *Language, literacy, and learning in STEM education* |
| 14 | Future visions for STEM | Banks, F., & Barlex, D. (2020). *Teaching STEM* |
| 15 | Final Exam Review | Students presentation |