# Materials Science in Engineering Course No. 41355 Credit: 0.5

|  |  |  |  |
| --- | --- | --- | --- |
| **Student name:** |  | **Graduation Date:** |  |

Pathways and CIP Codes:Energy (17.2071); **Engineering & Applied Mathematics (14.0101)**

Course Description: An **application level** course designed to teach students the properties, classes, uses, and selection of materials for various applications.

Directions:The following competencies are required for full approval of this course. Check the appropriate number to indicate the level of competency reached for learner evaluation.

**RATING SCALE:**

4. Exemplary Achievement: Student possesses outstanding knowledge, skills or professional attitude.

3. Proficient Achievement:Student demonstrates good knowledge, skills or professional attitude. Requires limited supervision.

2. Limited Achievement:Student demonstrates fragmented knowledge, skills or professional attitude. Requires close supervision.

1. Inadequate Achievement:Student lacks knowledge, skills or professional attitude.

0. No Instruction/Training:Student has not received instruction or training in this area.

## Benchmark 1: Click or tap here to enter text.

### Competencies

| **#** | **DESCRIPTION** | **RATING** |
| --- | --- | --- |
| 1.1 | Research key participants & events in the history of materials science & engineering to include: metallurgy, polymers, ceramics, and composite development. |  |
| 1.2 | Identify professional organizations & resources for materials science. |  |
| 1.3 | Recognize, locate, & utilize MSDS information in the workplace. |  |
| 1.4 | Evaluate physical properties of materials: solid, liquid, gas, and plasma. |  |
| 1.5 | Explain materials properties related to: |  |
|  | 1. Mechanical |  |
|  | 1. Electrical |  |
|  | 1. Thermal |  |
|  | 1. Chemical |  |
|  | 1. Optical |  |
|  | 1. Acoustical |  |
|  | 1. Environmental |  |
|  | 1. Atomic & Manufacturing. |  |
| 1.6 | Summarize key properties of: |  |
|  | 1. reactivity |  |
|  | 1. toxicity |  |
|  | 1. flammability |  |
|  | 1. stability. |  |
| 1.7 | Distinguish various classes of materials: |  |
|  | 1. crystals |  |
|  | 1. metals |  |
|  | 1. semiconductors |  |
|  | 1. polymers |  |
|  | 1. composites |  |
|  | 1. ceramics/vitreous. |  |
| 1.8 | Explain the fundamentals of materials in terms of structural properties, behaviors under varying conditions, bonding, conductivity, chemical reaction, and decomposition. |  |
| 1.9 | List examples of specialized usage of materials in industry. |  |
| 1.10 | Defend choices for using one material over another in specific applications. |  |
| 1.11 | Compare and contrast methods of chemical and physical bonding. |  |
| 1.12 | Defend, in various applications, whether it is better to use chemical of physical bonding. |  |
| 1.13 | Define tribology and its importance. |  |
| 1.14 | Detail the impact of biomaterials on industry. |  |
| 1.15 | Research a material that has recently become available or recently adopted for widespread use and how it may impact future design & development. |  |
| 1.16 | Explain how availability of new materials has changed manufacturing processes. |  |
| 1.17 | Compare and contrast techniques for testing the integrity of a part made from a particular material. |  |
| 1.18 | Create 2D or 3D Model(s) that explain understanding of various types of materials related to science and engineering. |  |

I certify that the student has received training in the areas indicated.

Instructor Signature:

For more information, contact:

CTE Pathways Help Desk

(785) 296-4908

[pathwayshelpdesk@ksde.org](mailto:pathwayshelpdesk@ksde.org)



900 S.W. Jackson Street, Suite 102

Topeka, Kansas 66612-1212

[https://www.ksde.org](https://www.ksde.org/)

The Kansas State Department of Education does not discriminate on the basis of race, color, national origin, sex, disability or age in its programs and activities and provides equal access to any group officially affiliated with the Boy Scouts of America and other designated youth groups. The following person has been designated to handle inquiries regarding the nondiscrimination policies: KSDE General Counsel, Office of General Counsel, KSDE, Landon State Office Building, 900 S.W. Jackson, Suite 102, Topeka, KS 66612, (785) 296-3201.