1. ***FST 2101 FOOD ENGINEERING I***
2. ***COURSE INSTRUCTOR(S)***

* *Associate Prof W. Kyamuhangire*
* *Mr. Robert Mugabi*

1. ***COURSE TYPE:***

*Core course for Year II BSc. Food Science & Technology*

1. ***COURSE STRUCTURE***

*Course is 3 credit units (3 CU): 2 lecture hours and 2 practical hours per week for 15*

*study weeks; [i.e. 30 lecture hours & 30 practical hours equivalent to 45 contact*

*hours].*

1. ***COURSE DESCRIPTION***

*Basic concepts of food process engineering; First and second law of thermodynamics; Heat and mass balance; Heat transfer; The flow of fluids; Physical properties of foods: optical, thermal, electrical, mechanical, geometrical and rheology of food (integrated within the different topics).*

1. ***COURSE OBJECTIVES***

*1. Develop their problem solving skills.*

*2. Be able of evaluating material and energy balance in processing industry.*

*3. Acquire a fundamental understanding of heat transfer mechanisms.*

*4. Increase the basic understanding of selected unit operations in food processing.*

1. ***RECOMMENEDED REFERENCES***
2. *R.P. Singh, and D.R. Heldman. (1993). Introduction to Food Engineering, 2nd Ed., Academic Press.*
3. *P.G. Smith. (2003). Introduction to Food Engineering, Kluwer Academic/Plenum Publishers*
4. ***COURSE CONTENT, METHODS OF INSTRUCTION, TOOLS AND***

***EQUIPMENT***

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| ***TOPIC*** | ***CONTENT*** | ***METHOD OF INSTRUCTION/ Time allocation***  ***(i.e. contact hours)*** | ***TOOLS/ Equipment needed*** |
| 1. *Basic Principles of Food Process Engineering* | * *Conservation of mass and energy; overall view of engineering process* * *Dimensions and Units; units, dimensions, dimensionless ratios, dimensional consistency & unit conversion* | *-Interactive lectures*  *(5 hrs)*  *-Take home assignments*  *- Tutorials (3 hrs)* | *LCD projector/ BB/ White boards / Flip charts* |
| 1. *Material and Energy Balances* | * *Material Balances; basis & units, types of process situations (continuous & batch processes)* * *Energy balances* | *-Interactive lectures*  *(9 hrs)*  *-Take home assignments*  *- Tutorials (6 hrs)* | *LCD projector/ BB/ White boards / Flip charts/ Materials* |
| 1. *First and Second Law of Thermodynamics* | * *First law of thermodynamics* * *Second law of thermodynamics* * *Law of conservation* | *-Interactive lectures*  *(4 hrs)* | *LCD projector/ BB/ White boards / Flip charts/ Materials* |
|  | *Mid semester Evaluation* | *- Mid semester test*  *(2 hrs)*  *- Revision of test (2 hrs)* |  |
| 1. *Fluid flow theory* | * *Fluid statics* * *Fluid dynamics; mass & energy balances, Bernoulli’s equation* * *Viscosity; Newtonian & Non-Newtonian fluids* * *Laminar & turbulent flow* * *Energy losses in flow; friction in pipes, losses in bends & fittings, pressure drop through equipments, equivalent length of pipes* | *- Interactive lecture*  *(9 hrs)*  *- Tutorials (6 hrs)* | *LCD projector/ BB/ White boards / Flip charts* |
| 1. *Heat transfer theory* | * *Heat conduction* * *Surface heat transfer* * *Unsteady-state heat transfer* * *Radiation heat transfer* * *Convection heat transfer; natural & forced* * *Overall heat transfer coefficients* * *Steam tables* | *-Interactive lectures*  *(6 hrs)*  *-Take home assignments*  *-Tutorials (4 hrs)* | *LCD projector/ BB/ White boards / Flip charts/ Materials* |
| 1. *Heat transfer applications* | * *Heat exchangers; continuous-flow heat exchangers, scraped surface heat exchangers, plate heat exchangers* * *Thermal processing; thermal death, equivalent killing power at other temperatures* | *- Interactive lectures*  *(9 hrs)*  *-Take home assignments*  *-Tutorials & revision (6 hrs)* | *LCD projector/ BB/ White boards / Flip charts/ Materials* |
|  | *End of semester Evaluation* | *- End of semester test (2 hrs)*  *-Revision of test (2 hrs)* |  |

1. ***SUMMARY OF TIME NEEDED***

* *Lecture hours 30 hrs*
* *Tutorial hours 30 hsr*

1. ***OVERALL COURSE EVALUATION***

* *Individual assignments and test 40%*
* *Final exam 60%*