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%*