Modelling Fluid Flow The State Of The Art Free Pdf Books

[BOOK] Modelling Fluid Flow The State Of The Art Free Pdf Books.PDF. You can download and read online PDF file Book Modelling Fluid Flow The State Of The Art Free Pdf Books only if you are registered here.Download and read online Modelling Fluid Flow The State Of The Art Free Pdf Books PDF Book file easily for everyone or every device. And also You can download or readonline all file PDF Book that related with Modelling Fluid Flow The State Of The Art Free Pdf Books Book everyone. It's free to register here toget Modelling Fluid Flow The State Of The Art Free Pdf Books Book file PDF. file Modelling Fluid Flow The State Of The Art Free Pdf Books Book Free Download PDF at Our eBook Library. This Book have some digitalformats such us: kindle, epub, ebook, paperbook, and another formats. Here is The Complete PDF Library

Numerical Study Of Gas-Solids Hydrodynamics In Downer

Numerical Study Of Gas-Solids Hydrodynamics In Downer Bhuvaneswari G1,*, Jakka Sarat Chandra Babu2, T.K.Radhakrishnan3 1 ... Computational Fluid Dynamics (CFD) This Numerical Study Employs Commercial CFD Program FLUENT9 For Modelling The System. The Eulerian Approach With Kinetic Theory Of Granular Flow Is Recommended To Apply For Modelling The System Of Interest, Downer. In This Study The ... Jul 17th, 2020

Modelling Complex Particle-Fluid Flow With A Discrete ...

Fluid Dynamics (CFD) Methods At Different Scales Of Time And Length Are Developed To Model The Single?phase Fluid Flow, Ranging From Discrete Models, E.g., The Lattice Boltzmann Method (LBM) [19-21], To Continuum Models, E.g., The Direct Numerical Simulation (DNS) [22], The Large Eddy Simulation ... May 5th, 2020

Modelling Flow Through Fractures In Porous Media

Keywords: Porous Media, Fracture, Darcy's Law, Free Fluids, Streamfunction . 1. Introduction . There Are Various Natural Circumstances In Which Fluid Flux Through A Porous Medium Is Dominated By Fracture Flow. Geological Layers Can Be Fractured, As Well As Porous Materials Used In Technical Devices, For Example In Membranes, Filters Etc. Jul 10th, 2020

3 Fluid Flow In Porous Media - Particles.org.uk

3 Fluid Flow In Porous Media In Chapter 2 We Considered How To Represent A Particle Size Distribution By, Where Possible, A Single Term That Is Representative Of All The Particle Sizes. This Term May Then Be Used For Modelling, Design Or Simply To

Understand A Process Within Particle Technology. One Such Example Is In The Fluid Flow Through A Porous Medium, Or Porous Media (plural). There Are ... Oct 22th, 2020

Mathematical Modelling Of Particles In Fluid Flow August ...

Mathematical Modelling Of Particles In Fluid Flow August 18 - 22, 2014! MEALS! *Breakfast (Buffet): Sally Borden Building, Monday - Friday *Lunch (Buffet): Sally Borden Building, Monday - Friday *Dinner (Buffet): Sally Borden Building, Sunday - Thursday Coffee Breaks: As Per Daily Schedule, In The Foyer Of The TransCanada Pipeline Pavillion (TCPL) Jul 9th, 2020

Updated 24/06/2015 1/23 - Unibas.it

Updated 24/06/2015 1/23 . Type # Title Authors/Editors Publishers Year CR 001 CHEMICALLY REACTING FLOW Theory And Practice Robert J. Kee, Michael E. Coltrin, Peter Glarborg WILEY INTERSCIENCE 2003 CR-CFD 002 Advances In Chemical Engineering, Volume 31 - Computational Fluid Dynamics Guy B. Marin (Editor) Academic Press 2006 MP 003 MULTIPHASE REACTING FLOWS: MODELLING AND SIMULATION DANIELE L ... Jun 9th, 2020

MODELLING OF SUPERSONIC GAS FLOW OF NOZZLES FOR LASER ...

MODELLING OF SUPERSONIC GAS FLOW OF NOZZLES FOR LASER CUTTING SYSTEMS I. Dohnke1, D. Peter1, J. Comps2, T. Sprunk2, K.C. Heiniger2 1Bystronic Laser AG, R & D Laser Photonics, Switzerland; 2 Labor Für Thermo- Und Fluid Engineering, Fachhochschule Aargau, Switzerland Abstract Nozzles For Laser Cutting Systems Play An Important Role For Material Processing, Jul 14th, 2020

COMPREHENSIVE DEM-DPM-CFD SIMULATIONS - MODEL SYNTHESIS ...

Commercial Software Packages EDEM And FLUENT By An In-house Code. While The Former Covers The DEM Modelling, The Latter Describes The Fluid Dynamics Of The Continuous Phase And The Motion Of Particles In Dilute Flow Regimes By Means Of The Discrete Phase Model. A Further Implementation Of The Coupling, Using The Open-source Software OpenFOAM As CFD Solver And The Molecular Dynamics Software ... Sep 1th, 2020

Short Syllabi Of The Courses For B. Tech. Degree In ...

Text Book: 1. Johnson R.A, Miller& Freund's Probability And Statistics For Engineers, ... Fluid Machinery 3-0-0-3 Integral Form Of Continuity, Momentum And Energy Equations – Flow Of Fluids Over Flat And Curved Surfaces – Dimensional Analysis –

Rayleigh's Method And Buckingham? Theorem- Principles Of Modelling And Similitude As Applied To Turbomachines- Euler's Turbine Equation ... Mar 23th, 2020

Modelling And Simulation Of Fluid Catalytic Cracking Unit

In The Literature And Plant Data And The Results Are Found To Be In Good Agreement. The Results Of Simulation Show That The Process Is Strongly Influenced By The Catalyst Flow Rate, And Any Increase In The Amount Of Coke On The Catalyst And Regenerator Temperature Would Be Compensated By A Larger Rate Of Consumption Of The Oxygen. Keywords: Fluid Catalytic Cracking; Process Modelling; Dynamic ... Oct 9th, 2020

CHAPTER 3 FINITE ELEMENT MODELLING AND METHODOLOGY

The Finite Element Method Can Be Used For Analysis Of Structures/solids Of Complex Shapes And Complicated Boundary Conditions. Its Applications Range From Deformation And Stress Analysis Of Automotive, Air Craft, Building And Bridge Structures To Field Analysis Of Heat Flux, Fluid Flow, Magnetic Flux, Seepage And Other Flow Problems. With The Advances In Computer Technology And CAD Systems ... Jan 5th, 2020

Fluid Dynamics Of Blood Flow - Modelling & Simulation

Mechanics 2. Makoto Ohta ** - Experimental Modelling 3. Karkenahalli Srinivas * - Computational Fluid Dynamics 4. Toshio Nakayama** - Sample CFD Results * University Of Sydney ** Tohoku University Contact: M.behnia@usyd.edu.au. Types Of Flow Laminar Turbulent Newtonian Non-Newtonian Steady Unsteady. Laminar & Turbulent Reynolds, O.: On The Experimental Investigation Of The Circumstances ... Sep 5th, 2020

Fluid Flow Induced Internal Erosion Within Porous Media ...

Transp Porous Med (2011) 89:441–457 DOI 10.1007/s11242-011-9779-9 Fluid Flow Induced Internal Erosion Within Porous Media: Modelling Of The No Erosion Filter Test Jun 5th, 2020

Hydrothermal Systems Rock Deformation Fluid Flow Heat ...

Transport Is An Emerging Exploration Tool, Which Can Provide A More Quantitative Exploration Effort. The Focus Of The Course 'Process Modelling Of Hydrothermal Systems' Is On Coupled Numerical Simulations Of Fluid Flow, Heat Transfer, Multi Species Transport And Che-mical Reactions And How These Processes Relate To Rock Deformation And Geodyna- Aug 14th,

Modelling Of The Through-airbonding Process

At Microscale. The Effects Of The Fiber Diameter, ... Fluid Flow And Heat Transfer. It Has Been Extensively Used In The Field Of Aerospace, Automotive, Biomedical, Chemical And Many Other Industrial Applications. Its Use In Textile Research And Development Is However Not Very Common. There Are Only Very Few Examples Of Such Computational Modelling In Textile Research And Development. Gong Et ... Sep 12th, 2020

Flow Modelling In Low Permeability Unconventional Reservoirs

Spacing's, With The Presence Of A Stimulated Reservoir Volume (SRV) And A Non-SRV Zone, Is Studied. In This Chapter, The Efficiency Of The MINC Method For Both Single-phase And Two-phase Flow Is Discussed. Finally, The Impact Of Fracturing Fluid Invasion On Gas Production Is Presented. In . Chapter 4 - Extension Of The Hybrid Approach To The Discrete Fracture Model, A Generalization Of The ... Oct 14th, 2020

Modelling And Stress Analysis Of Flare Piping

Piping Stress Analysis Is A Term Applied To Calculations, Which Address The Static And Dynamic Loading Resulting From The Effects Of Gravity, Temperature Changes, Internal And External Pressures, Changes In Fluid Flow Rate And Seismic Activity. A Hot Piping System Will Expand Or Elongate. A Cold Piping System Will Contract Or Shrink. Both These Create Stress Problems. Stress Analysis ... Jul 16th, 2020

COMPUTER MODELLING OF HEAT AND FLUID FLOW IN MATERIALS ...

Download: COMPUTER MODELLING OF HEAT AND FLUID FLOW IN MATERIALS PROCESSING LIBRARYDOC01 PDF Best Of All, They Are Entirely Free To Find, Use And Download, So There Is No Cost Or Stress At All. Computer Modelling Of Heat And Fluid Flow In Materials Processing Librarydoc01 PDF May Not Make Sep 14th, 2020

Modelling Heat Transfer And Fluid Flow Inside A Pressure ...

Modelling Heat Transfer And Fluid Flow Inside A Pressure Cooker 5 Just Before Valve Opening (t=145s), It Can Be Observed From The Simulation (figure 3) That There Is A Hot And Wet Zone Near The Bottom Where Water Is Heated Up And Evaporates. The Spherical Products And The Upper Ring Of The Basket Act As A Separation Between The Bottom And Top

Regions. The Top Zone Is Quite Homogeneous ... Mar 9th, 2020

Series In Materials Science And Engineering Computer ...

Computer Modelling Of Heat And Fluid Flow In Materials Processing Chun-Pyo Hong Yonsei University, Korea IoP Institute Of Physics Publishing Bristol And Philadelphia . Contents Preface Xi 1 Mechanisms Of Transport Phenomena 1 1.1 Heat Transfer 1 1.1.1 Conduction—Fourier's Law Of Conduction 1 1.1.2 Convection 2 1.1.3 Radiation 5 1.2 Mass Transfer 6 1.2.1 Diffusion—Fick's Law Of Diffusion 6 ... Jul 25th, 2020

PAPER OPEN ACCESS Numerical Modelling Of Heat Transfer In ...

Numerical Modelling Of Two Heat Transfer Processes In The Convector's Pipes Has Been Implemented. The Input Data Is Determined By The Developed Methods. Dimensions Of Fluid Flow Are Assumed To: $D=8\,Mm$, And $L=4087\,Mm$. These Are The Geometric Dimensions Of The Internal Surface Of The Convector's Pipes [11]. The Input Data Of The Simulated ... Feb 25th, 2020

A Validation Method Of Computational Fluid Dynamics (CFD ...

Theoretical Fundamentals Of Computer Modelling Of Hydraulic Transients The Following Equations Are Generally Utilized For Computer-based Hydraulic Modelling For Transient Flow In A Pipe. The Time-dependent, One-dimensional Flow Of A Fluid In An Inclined Conical Conduit, As Shown In Figure 2 Can Be Described By Three Equations Representing Conservation Of Mass, Momentum, And Energy [1]. The ... Apr 4th, 2020

Simulation Of Weld Solidification Microstructure And Its ...

Its Coupling To The Macroscopic Heat And Fluid Flow Modelling To Cite This Article: Vitaliy Pavlyk And Ulrich Dilthey 2004 Modelling Simul. Mater. Sci. Eng. 12 S33 View The Article Online For Updates And Enhancements. Related Content Phase-field Simulation Of Weld Solidification Microstructure In An Al Cu Alloy A Farzadi, M Do-Quang, S Serajzadeh Et Al.-Modeling Of Fundamental Phenomena In ... Feb 24th, 2020

Computational Fluid Dynamic Modelling Of Particle Charging ...

In This Study, A Computational Fluid-dynamic Model For Turbulent Flow, Particle Trajectory, And Particle Charging In ESPs Is Presented Using A Pre-developed Corona Discharge Model (Kim Et Al., 2010), Wherein Electric Field And Space Charge

Distributions In The Plasma Region Are Numerically Calculated. The ESP Under Consideration Is A Wire-to-plate Single- Stage ESP, Which Consists Of A Series ... Jul 7th, 2020

Numerical Evaluation Of Liquid Food Heat Sterilization In ...

Keywords: Mathematical Modelling; Computational Fluid Dynamics (CFD); Thermal Process; Sterilization. 1. Introduction Thermal Processing Is One Of The Most Utilized Methods For Food Preservation [1]. Appertization Is Still The Most Effective Conservation Method, Even When Compared To Recently Advanced Techniques [2, 3]. The Liquid Flow Characteristics Inside The Packaging During Heating Are A ... Jun 13th, 2020

CFD SIMULATION OF GLUCONIC ACID PRODUCTION IN A STIRRED ...

In This Contribution, Dynamic Modelling Of The Aerobic Biocatalytic Conversion Process In Viscous Batch Stirred Tank Reactor Is Developed. Its Operation Is Illustrated By Simulation Of The Interaction Of Fluid Flow, Mass Transfer And Reaction Relevant To Gluconic Acid Production By A Strictly Aerophilic Aspergiluc Niger Based On A "two- Fluid" Model. As A Result Of This Simulation, The ... Jun 17th, 2020

Flow Visualization Of Bubble Condensation In Forced ...

FLOW VISUALAZATION OF BUBBLE CONDENSATION IN FORCED CONVECTIVE SUBCOOLED BOILING FLOW R. Situ1, W. Yang2, J... Provides A Feasible Solution To These Complex Problems [1]. Provided That Suitable Boundary And Initial Conditions Are Imposed, The Spatial And Temporal Distribution Of Each Phase Can Be Adequately Simulated. The Weakest Link Of The Two-fluid Model Is, However, The Modelling Of The ... Aug 16th, 2020

University Of Huddersfield Repository

Then, Computational Fluid Dynamics Based Techniques Have Been Incorporated To Find Out The Same. The Results Have Been Compared And Validated. Further Tests At Higher Pressures Of Water Have Been Conducted To Evaluate Cv At Severe Service Conditions This Report Includes Details Of The Test Procedures, CFD Modelling And Full Set Of Results For Each Flow Condition And The Effect Of Manufacturing ... Aug 13th, 2020

Chapter 2 Governing Equations Of Fluid Dynamics

2.2 Modelling Of The Flow In Obtaining The Basic Equations Of ?uid Motion, The Following Philosophy Is Always Followed: (1)

Choose The Appropriate Fundamental Physical Principles From The Laws Of Physics, Such As (a) Mass Is Conserved. (b) F =ma (Newton's 2nd Law). (c) Energy Is Conserved. Oct 9th, 2020

Computational Modelling Of The Surface Roughness Effects ...

Proceedings Of The International Conference On Heat Transfer And Fluid Flow Prague, Czech Republic, August 11-12, 2014 Paper No. 192 192-1 Computational Modelling Of The Surface Roughness Effects On The Thermal-elastohydrodynamic Lubrication Problem Shian Gao Department Of Engineering, University Of Leicester University Road, Leicester LE1 7RH, UK Sg32@le.ac.uk Sutthinan Srirattayawong School ... Aug 12th, 2020

Modelling And Simulation Of Fluid-flow And Heat Transfer ...

Modelling And Simulation Of Fluid-flow And Heat Transfer In The Convective Zone Of A Power-generation Boiler Antonio Gómez, Norberto Fueyo, Luis Ignacio Díez To Cite This Version: Antonio Gómez, Norberto Fueyo, Luis Ignacio Díez. Modelling And Simulation Of Fluid-flow And Heat Transfer In The Convective Zone Of A Power-generation Boiler. Applied Thermal Engineering, Elsevier, 2008, 28 (5-6 ... Sep 24th, 2020

I Three-dimensional Modelling Of Fluid Flow In A Four ...

Ignition Engine D Mohan Krishna, K Rajagopal, P Srinivasa Rao & V Ganesan Department Of Mechanical Engineering, Indian Institute Of T~chnology, Madras 600 036, India Received 5 June 1993; Accepted 4 January 1994 This Paper Presents The Analysis Of Three-dimensional Calculations Of Flow Field Development In A Apr 20th, 2020

Modelling Flow Through Fractures In Porous Media

Modelling Flow Through Fractures In Porous Media . Ekkehard Holzbecher *,1, LiWah Wong1 And Marie-Sophie Litz2 1. Georg-August Universität Göttingen (GERMANY), 2Freie Universität Berlin (GERMANY) *Corresponding Author: Georg-August Universitä T Göttingen, Goldschmidtstr. 3, 37077 Göttingen, Eholzbe@gwdg.de . Abstract: There Are Various Alternative Options Concerning Modeling Fluid Flow ... Feb 16th, 2020

Population Balance Modelling Of Gas-Liquid Bubbly Flow ...

Liquid Flow Undergo Deformation, Coalescence, Breakage And Condensation Subject To Local Flow Conditions And Heat And Mass Transfer Processes. To Account For The Coalescence And Breakup Phenomenon Of Gas-liquid Bubbly Flows, The

Population Balance Modelling (PBM) Has Been Used Along With Continuity And Momentum Equations Within The Two Fluid Modelling Frameworks. A Comprehensive Population ... Sep 8th, 2020

SPRINKLER JET FLOW: CLASSICAL AND QUANTUM THERMAL-FLUID ...

Thermal Fluid Dynamic Modelling There Are Several Possibilities To Describe The Flight-event Associated To The System Composed By In-flight Droplet From The Sprinkler Nozzle To The Ground In Order To Feb 12th, 2020

Experimental And Numerical Investigation Of Boiling Flow ...

Experimental And Numerical Investigation Of Boiling Flow In A Vertical Pipe With Phase Change Using A Multi-fluid Modelling Approach R. Kopun1 & L. Škerget2 1AVL-AST D.o.o., Maribor, Slovenia 2Faculty Of Mechanical Engineering, University Of Maribor, Slovenia Abstract Mar 13th, 2020

Lectures In Brain Physics - 2020 Edition.

Lecture 1 Physics Of Cerebrospinal Fluid (CSF) Circulation In Brain: Sites And Mechanisms Of CSF Production, Circulation And Reabsorption. Physiological And Modelling Description. Lecture 2 Cerebral Blood Flow And Metabolism: Physiology Of Brain Blood Inflow, Circulation And Venous Outflow. Architecture Of Cerebrovascular Tree. Basic Physics Of ... Jun 10th, 2020

Modelling Conjugate Flow And Heat Transfer In A Ventilated ...

Modelling Conjugate Flow And Heat Transfer In A Ventilated Room For Indoor Thermal Comfort Assessment Kana Horikiri1 ... Is Adopted And It Has Been Already Implemented In ANSYS Fluent Software By Incorporating The Enthalpy Balance To Account For Radiative Heat Transfer From A Given Heating Source To Adjacent Medium (e.g. Fluid) Via A Finite Number Of Trajectories, Each Associated With A Vector ... Feb 18th, 2020

Computational Engineering Modelling - ASTUTE 2020

Mechanical And Dynamic Response Of A Solid In Fluid Flow, Or In An Electro-magnetic Field. LsDyna Multi-purpose Explicit And Implicit Finite Element Program Used To Analyse The Nonlinear Response Of Structures. Hyperworks Altair Hyperworks Is A Numerical Analysis Software Suite Mainly Based On The Finite Element Analysis. Its Strength Resides ... Sep 21th, 2020

Next Steps In Geomechanical Modelling For CCS

Core Scale Tiny (pore Scale) Group Liverpool BP Statoil LLNL LBNL Lab Core Measurements: Por/perm With Eff Stress; Perm Anisotropy With Eff Stress; Reactive Fluid Flow, AE Emissions Pore Scale Analysis Of Mineralogical & Por Structure Change With Eff Stress & Reactive Fluid Flow Seismic Data & Interp, STARS Coupled Model, Geomodels Prosper FTHP ... Feb 23th, 2020

CFD Modelling Of Condensation Process Of Water Vapor In ...

CFD Modeling Of Condensation Process Of Water Vapor In Supersonic Flows Yan Yang1, Jens Honore Walther2, 3, ... Two-phase Models For Predicting The Condensation Flow With The Classical Nucleation Theory. The Effects Of Friction Factor On The Condensation Flows In The Laval Nozzles Were Performed Using The Single Fluid Model By Mahpeykar & Teymourtash [17], And Jiang Et Al. [18]. Two ... May 11th, 2020

MACE Research Interests

David Apsley - Lecturer In Civil Engineering • Computational Fluid Dynamics (CFD) • CFD Renewables • Coastal Engineering • Computational Fluid Mechanics • Turbulence Modelling • Renewable Energy (marine And Wind) • Heat Transfer • Environmental Flow • Mathematical Programming In Fortran And C++ Andrea Bottacin Busolin - Lecturer In Water Engineering • Transport Phenomena In ... Oct 22th, 2020

3rd Workshop On Advances In CFD And LB Modeling Of ...

The Japanese Society For Multiphase Flow Workshop Description We Are Happy To Present This Workshop On The Latest Advances In The Computational Modelling Of The Interfa-cial Dynamics Of Capillary Two-phase Ow Phenomena Us-ing Computational Fluid Dynamics (CFD) And Lattice Boltzmann (LB) Methods. In Addition, Experimental Two-phase Ow Visualization Techniques Will Presented. The Workshop Is Now ... Mar 5th, 2020

Three-dimensional Flow Measurements And CFD Modelling In A ...

The Flow Field Is The Primary Control On Sedimentation In Storm-water Tanks. Particle Image Velocimetry And Acoustic Doppler Velocimetry Are Employed To Measure The 3D Mean Velocity And The Turbulent Kinetic Energy In Transversal Planes Of A Storm-water Tank. The Measurements Are Compared To The Simulated Results Of The Computational Fluid Dynamics (CFD) Software Fluent. When No Overflow ... May 18th, 2020

Mass Transfer And Slag-metal Reaction In Ladle Refining A ...

Slag-metal Reactions Into The Mass Transfer Modelling Strongly Would Enhance The Reliability And Amount Of Information To Be Analyzed From The CFD Calculations. In The Present Work, A Thermodynamic Model Taking All The Involved Slag Metal Reactions Into Consideration Was Incorporated Into A 2-D Fluid Flow Model Of An Argon Stirred Ladle. Both Thermodynamic Constraints And Mass Balance Were ... Jan 5th, 2020

Maîtrise Universitaire ès Sciences En Sciences De La Terre ...

• Fundamentals Of Numerical Modelling And Data Analysis • Reservoir Geology I • Reservoir Geology II • Advanced Structural Geology • Practical Seismic Reflection • Borehole Logging And Rock Physics • Pratique De La Géologie Environnementale • Introduction To Fluid Flow For Geologists Oct 5th, 2020

Modelling Thermal Time-of-Flight Sensor For Flow Velocity ...

Numeric Fluid Dynamics Simulation On A Pipe Flow Model. The Basic Background Is To Deter- Mine The Velocity Of A Flowing Fluid In A Pipe By Using The Thermal Time-of-Flight (TTOF) Method On Water. The Visualisation Of The Temperature And Velocity Distribution In The Pipe Model Is Being Carried Out In Order To Enable Proper Design And Optimisation Of The TTOF Sensor. The Work Is Accomplished In ... Sep 27th, 2020

PROCESS SIMULATION DYNAMIC MODELLING & CONTROL

Process Simulation Dynamic Modelling Contents Section 1 Introduction 5 Section 2 Dynamic Simulation Basics 7 Section 3 Process Measurement And Control 25 Section 4 Heat Exchangers 83 Section 5 Batch Distillation 89 Section 6 Continuous Distillation 113 Section 7 Batch Reactors 137 Section 8 Emergency Relief 167 Section 9 Engineering Fundamentals 175 9.1 Maths And Units 176 9.2 Fluid Flow 180 9 ... Jun 11th, 2020

MAIN AREAS OF RESEARCH FACULTY OF ARCHITECTURE - Kpi.ua

Research On Fluid-flow Compression Machines, Examination Of Solid, Liquid And Gas Fuels Combustion Processes, Research On Transport Of Momentum And Heat, Heat Turbines Components Assessment, Training And Preparation For Examinations For Aircraft Licenses, Perfecting Trainings Of Pilot Skills On Fregata Motoglider Simulator. Modelling Of Non-classical Construction Materials, Theory Of Machines ... Jul 1th, 2020

